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ABSTRACT

Four studies were conducted on how well teachers at various stages of development can decode a student's nonverbal behavior, particularly that which communicates a lack of comprehension. Participants in the studies were novice (n=9), advanced beginner (n=10), and expert (n=10) elementary school teachers. In the first study, the teachers viewed a tape, without sound, showing fourth-grade students responding to a test. The teachers were informed that the test items were designed to elicit problem-solving behavior, that the students had the ability to accurately assess what they did and did not know, and that the students were chosen because they might emit accurate nonverbal clues as to whether or not they had comprehended the question being asked. Study 2 focused on assessment of students' past performance as well as on nonverbal clues; study 3 repeated the test using as interpreters only the children who appeared in the tapes; study 4 used two preservice classes of teachers and sought information on how experience with children in social situations and self-ratings of social intelligence might affect performance. The major findings were that accuracy in decoding student comprehension from nonverbal clues is trainable and that classroom experience and knowledge of the child's personality, typical behavior, and past performance increase the accuracy of a teacher's assessment of a child's nonverbal behavior. (JD)

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EXPERT AND NOVICE TEACHERS' ABILITY TO JUDGE STUDENT UNDERSTANDING

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INTRODUCTION

The ability to decode students' nonverbal behavior, particularly that which communicates a lack of comprehension, is an important skill for teachers to develop. At times students may be confused or totally lack understanding of some point and they may be unable or unwilling to ask teachers for help. From observations of the students' body language and facial expressions, the perceptive teacher decides whether there is a need to check on comprehension, provide more instruction or a different kind of instruction, assign more practice, and so forth. It is generally believed that experienced or expert teachers possess the ability to accurately assess their students comprehension, though research on this topic is not extensive. To study this topic knowledge is needed about how students know whether they comprehend something and how teachers at various stages of development read the cues emitted by students. This study is an attempt to learn more about these issues.

Students' self-evaluation of comprehension. Some research on interpersonal communication in the classroom has examined students' ability to assess their own comprehension. Bearison and Levey (1977) studied kindergarten, second, and fourth grade students' ability to judge their own understanding. After listening to questions, the students were asked to label each one as good or bad, based on their own ability to answer it given the information provided. In a

similar study (Ironsmith & Whitehurst, 1978), kindergarten, second, fourth and sixth grade students were exposed to an ambiguous or nonambiguous description presented auditorally by the investigator, and then asked to identify a picture that was representative of the communication. In both studies, the ability to assess one's own comprehension increased with age. If we assume that these two studies measured the same construct among pre-school and grade school children, performance on a task requiring self-evaluation of knowledge may be strongly related to age. Both studies required an overt response to the investigator, and younger children in the samples may have been less willing to verbalize their confusion to an unfamiliar adult. The younger aged children may also lack the experience and vocabulary necessary to express their understanding of their own knowing. So, experience (number of years) in the educational system may be another factor affecting performance on a self-evaluation of knowledge task, when comparing across age groups. Some evidence of this is provided in Patterson, Cosgrove and O'Brian (1980), who found that preschoolers were able to recognize noninformative messages as evidenced by their nonverbal behavior, including eye contact, body movement, hand movement and reaction time. But, the children were not adept at expressing their confusion verbally. From the extant research it would appear that the ability to emit non-verbal cues of comprehension/noncomprehension appears early, but that reliable verbal expression of this aspect of communicating is delayed until approximately the intermediate grade levels of school.

Teachers' ability to decode non-verbal cues. Jecker, Maccoby, Breitrose & Rose (1964) studied teachers' ability to decode both verbal and non-verbal cues emitted by students. Their work revealed that teachers are less perceptive at decoding nonverbal cues than verbal cues, and that their reliance on nonverbal cues can lead to confusion. Nonsignificant differences in decoding nonverbal cues

of comprehension were noted across three groups of subjects--new intern teachers, inexperienced teachers and experienced teachers. The investigators concluded that neither teacher training nor classroom experience are effective at improving this ability. In a follow-up study, Jecker, Maccoby & Breitrose (1965) determined that specialized training does improve accuracy in decoding student non-verbal cues of comprehension. Teachers in that study were provided with analysis forms prepared by the investigators, to use in evaluating student comprehension as seen in film clips of students attending to instruction. The teacher's attention was directed to a variety of factors (hand movement, body movement, blinking, etc.) which were judged to be the most salient features of the film clip being studied. Under these conditions, training was found to improve accuracy. The investigators also concluded that there are common patterns of non-verbal cues that can readily be identified.

Machida (1986) completed a cross-cultural study of Mexican American and Anglo teachers' ability to judge comprehension among anglo american, proficient bilingual and limited English speaking first graders. While slight cultural differences in nonverbal behavior across these groups were noted, teachers of both cultures were able to decode those cues accurately. No significant differences between teachers' groups were noted; however, the level of experience of the teachers was not examined.

In the first study to be described novice, advanced beginner, and expert teachers were compared in their ability to judge student comprehension from non-verbal behavior. The non-verbal behavior was presented by a videotape showing students responding to a problem posed to them by a teacher. The students that were viewed on the tapes were carefully chosen based on their "feeling of knowing" (Metcalfe, 1986). That is, they were picked for the accuracy of their metacognitive thinking about how easy or difficult a problem was to

solve. Children who possess well developed metacognitive strategies might be expected to provide clear non-verbal cues, that accurately reflect their comprehension and which contain the least ambiguity to observers. Under conditions where students were judged to be capable of emitting accurate non-verbal cues, it was hypothesized that expert teachers would perform better than either advanced beginners or novice teachers, and that discussion of the criteria for their decisions would serve as training for higher performance on subsequent tapes. Two methods of discussion of the cues emitted by the students constituted the independent variable. No prepared list of non-verbal cues for teachers to use as an aid to evaluation was provided.

METHOD

Design

For study one, a 3 x 2 factorial design was used. The between subject factors were experience level of the teacher (Novice, Advanced Beginner, Expert) and training condition (Discussion vs. discussion with feedback). The dependent variables were accuracy in assessing student response (correct or error), and confidence in that decision (ratings from 1-5)

Subjects

9 novices, 10 advanced beginner, and 10 expert teachers were recruited from the Peoria Unified School District in Arizona and Arizona State University teacher education classes. Expert teachers were nominated for inclusion in the study by their principals, assistant principals or staff development personnel, based on Berliner's (1988) criteria. Those designated as experts all had at least 5 years of recent consecutive teaching service. Advanced beginners were teachers

with one or two years teaching experience. Novices were students enrolled in teacher education course work, some of whom had student teaching experience, some of whom did not.

Stimulus Tapes

Peoria school district 4th grade students in 3 classes were administered a ten item multiple-choice test presented auditorally by the students' regular classroom teacher, within the regular classroom setting, according to a prearranged script. Items on the test were designed to be at an appropriate listening level, and were at the third grade reading level on the Fry Readability Chart. Questions were drawn from three areas: math reasoning, spatial relationships, and verbal reasoning. The questions each were designed to require two or three problem solving steps. (Example: John is bigger than Sam, Sam is bigger than Joe, is John bigger than Joe?) One repetition of each item was allowed. Only the response options were provided on the students' answer sheets. The questions were heard and had to be kept in memory. In addition to indicating their choice of response, students were instructed to rate their level of confidence in their responses on a scale of 1-5, with 1 indicating the lowest level of confidence. Sample items were used at the beginning of the test to give students practice with solving these kinds of problems and in assessing their level of confidence. The tests were scored to identify students who had the highest proportion of high confidence correct responses coupled with low confidence incorrect responses. Pilot testing had revealed that students who answered in either way had the potential to exhibit the least ambiguous non-verbal cues because of the high degree of awareness of their own comprehension. A set of six target students were identified in this way.

One week later students received a parallel form of the earlier test, while being videotaped in their regular classroom. In each classroom, two video camcorders were positioned in the front of the classroom, facing the students, one on either side. The students were told beforehand that the entire class would be on camera, though only the target students were actually being videotaped. Since natural responses were desired of the target students, seating of the target students was not altered to accommodate the filming. Sixty individual clips of target students answering questions were obtained, each approximately 20-30 seconds in length. The answer sheets of these students were scored to identify those items that were responded to correctly with the highest level of confidence or which were responded to incorrectly with the lowest level of confidence. Of the clips that fit this pattern, 30 were chosen at random, with consideration for obtaining a representative sample of each of the six target students. These clips were divided in half and transferred in random order to two videocassette tapes, providing two parallel forms of the stimuli's materials.

Procedures

The 29 teachers were randomly assigned to one of five groups to view the tapes. With one exception, each viewing group contained at least 2 teachers from each level of teaching experience. Groups were assigned to one of two treatments, discussion or discussion with feedback. The experiment was conducted in a small classroom on the campus of an elementary school. Teachers were seated in a horseshoe arrangement facing a TV monitor, with a video camcorder to the left of the monitor recording their work.

After a group had assembled, teachers were told they were going to view a tape, without sound, showing 4th grade students responding to a test. The subjects were informed that the test items were designed to elicit problem solving

behavior, that these students were chosen for their ability to accurately assess what they did and did not know; and that they were chosen because they might emit accurate non-verbal cues as to whether or not they had comprehended the question being asked. The importance of teachers' ability to assess students' comprehension using non-verbal cues was discussed. Non-verbal cues were referred to as facial expressions and body language, with no reference made to examples of either. The subjects were told to watch each clip and to determine from the students' non-verbal cues the accuracy of the student's response, and to rate their level of confidence in the judgment they had rendered. Subjects were informed that the clips were random selections, and that there was no guarantee that the clips were half correct and half incorrect responses. Subjects in the group responded individually on a printed answer sheet, rating each student as having responded correctly or incorrectly to each item, and rating their own level of confidence in their response. Following this, the group of subjects viewed the same tape for a second time. For those assigned to the discussion treatment group, after each clip, subjects were encouraged to discuss the criteria for their response with one another and to indicate which non-verbal behaviors were most salient in their decision. One of the first two researchers served as group moderator, asking questions such as: "Who thought this student got the item right (or wrong)?" "Why did you think so?" " Anyone disagree?" "Anyone else want to comment?". These subjects were not provided feedback on the accuracy of their response. The same kind of discussion followed the viewing of each of the 15 clips on this tape. After all the clips on tape one had been seen and discussed, the group viewed the 15 clips comprising tape 2, once again noting their response and their level of confidence in their response. Answer sheets were then collected, concluding the participation of the subjects in the study. For the feedback treatment, teachers discussed the criteria for their 15 responses during the

second viewing of tape 1, as in the discussion treatment, but they were also given feedback on the accuracy of their response to each clip before moving to the next clip. All groups were videotaped. The videotapes of the teachers' discussions were analyzed to inquire if qualitative differences appeared among the discussion groups, and among the experts, advanced beginners and novices that comprised each group.

RESULTS AND DISCUSSION

Quantitative Analysis. For the discussion plus feedback treatment, the level of performance in correctly identifying non-verbal cues of comprehension increased in all groups. Compared to tape one the gains on tape two for experts, advanced beginners and novices were +1.7, +1.8, +1.0, respectively. The corresponding mean certainty changes were -0.1, +0.2, -0.1, an inconsistent pattern with changes of little magnitude. Anovats on both dependent measures revealed that these differences were not statistically significant. For the discussion treatment, performance between tape one and tape two increased for Experts (+0.05), but decreased for both advanced beginners and novices (-0.2, -2.3). The corresponding mean certainty changes for experts, advanced beginners, and novices were +0.1, -0.9, +1.1, respectively. These gains were not statistically significant. As shown in Table 1, there is some support for our first hypothesis, that Experts would outperform both of the other groups of teachers; however, the differences between these groups were small.

Qualitative Analysis. Analysis of the discussions held in conjunction with the viewing of the first tape provided useful information on the qualitative differences between the ways groups arrived at their decisions. It appeared as if experts in these groups tried to contextualize the student's behavior by repeatedly asking the moderator for information about the child and the task to

which they were responding--something very difficult to infer when no sound is provided on the tapes. They asked, also, how the student performed in school on a regular basis. They wanted to know about the testing environment, such as what was the point that the teacher stopped reading the question. They asked about the questions, and whether each child knew they were being singled out for taping. In each case, experts were told that this information was unavailable and they were to work only with the non-verbal cues that were presented. More than others, the experts seemed to feel that this was a near impossible task, and this belief may be reflected in the low levels of confidence they had to their own responses. The experts also reported relying on their knowledge of past students who behaved in a similar manner to arrive at a decision. They frequently were heard to make remarks like, "Oh, I've had a student like that". It is interesting to note that experts consistently had a difficult time assessing the atypical student. One male student exhibited behaviors which experts interpreted as indicating low ability and low motivation (slumped over desk, head down and slow response time); however, subsequent to this experiment he was identified as gifted in intellectual potential and was recommended for placement in the district program for academically talented students. Obviously, his behavior indicated something much different. His responses to the problems he was given were consistently correct, and he had high confidence in those responses. He may have felt the test was quite easy and behaved accordingly.

Advanced beginners and novices appeared alike in that they did not contextualize their responses but personalized them. Each could be heard to make remarks such as, "That's what I do when I don't understand" or "I always flip my hair like her when I feel confident". Each novice and advanced beginner relied on their own patterns of behavior to evaluate the clips and invariably overgeneralized using words such as always and never. Results from the analysis

of tape 1 indicate that their decisions were reasonably accurate. Yet, the evidence from their performance with tape 2 suggests that they were easily swayed from their own opinions, especially in the discussion only treatment, when the validity of their own decision processes could not be verified. Their responses to tape 2 were less accurate.

Regardless of whether a teacher viewed the student as correct or incorrect, similar cues were noted. These cues have been sorted into 11 categories and are presented as Table 2. What is interesting to note is that teachers did not attribute the same meaning to the cue. For example, when discussing latency of response, which was a cue frequently used in making judgments of comprehension or noncomprehension, one teacher would report that the child had responded slowly and so was taking his time, concentrating on the problem, and probably reaching the correct answer. Another teacher, however, would identify the speed of the child's response as an indicator of indecision and would judge the child to be incorrect. This kind of lack of consensus about the meaning of the cues was noted in all three groups of teachers. Discussions where consensus was lacking seemed to influence later decisions, especially among teachers in the discussion treatment, and particularly among the novice teachers in that treatment, whose performance fell off sharply on Tape 2. Presumably, the decrement they displayed was because they were listening to those with greater experience and status, and altering the decision rules they were using in their subsequent responses.

Conclusion

Six things were learned from this investigation. First, experts were not any better at this task than other teachers, as judged by performance on tape one. Nevertheless, expert teachers did, as hypothesized, outperform those with less experience on tape 2. But these differences were slight and not significant.

Second, it appeared as if there was a training effect. The tape two scores were higher for experts, advanced beginners and novices when they had feedback about their performance along with discussion of the particular film clip. The feedback about the correctness or incorrectness of their responses apparently served to modify their performance.

Third, non-verbal cues in and of themselves are easily recognizable; however, the interpretation of them is not consistent. Different people utilize different social perspectives in their assessment of the meaning of behavior emitted non-verbally. The perspective used by any given observer is generally accurate; however, there are instances when cues emitted are inconsistent with the observer's conceptual framework and incorrect judgments are made. These appear to be relatively resistant to change. Confusion also arises when two or more people attempt to reconcile their differing judgments by combining criteria.

Fourth, experts had greater needs to contextualize the situation--to seek more meaning and information--than did novices or advanced beginners.

Fifth, experts made use of their past classroom experience, their case knowledge, to interpret the behaviors that they viewed. Novices and advanced beginners, on the other hand, relyed on their own personal knowledge, more often judging events based on what they did or on how they act.

Finally, expert teachers develop composite pictures of the common and the usual and are as much at a loss as less experienced teachers when they encounter the atypical or unusual student.

Study 2

Because expert, experienced teachers seemed to be only marginally better at interpreting the comprehension cues emitted by students than those less experienced, it was hypothesized that their presumed ability might be confined to

their own classes. The ability to comprehend these cues may require personal knowledge of the students being judged, and/or extensive time with them. The consistent questioning by the expert teachers in our sample, about the context for instruction and the background of the student, suggested that the ability to read comprehension cues may exist among experienced/expert teachers, but only in their own class. A way to gain some insight into that hypothesis was to show the tapes that had been created to the three 4th grade teachers of the target students. Two of the students in the clips were currently enrolled in each one of the classes of the three teachers, but the teachers had incidental knowledge of the other four target students from participation in field trips; playground, lunch and recess duty; knowledge of older siblings; and conversations with other teachers regarding their students throughout the year. Each of these three teachers had been identified by their principals as expert.

Teachers viewed the tapes with the first researcher, individually, during regular school hours. After viewing tape 1 in its entirety, each teacher received feedback on the correctness of their responses and immediately viewed tape 2. The mean number correct for tape 1 was 10.6 with a confidence level of 2.8. Performance on tape 2 this score increased to 11.0, and confidence ratings had increased to 3.1. (See Table 3). These levels of performance and confidence were considerably higher than for the subjects in Study One. (See Table 1). Knowledge of the day to day behavior of the students apparently had a clear advantage. Consistently, teachers mediated their responses with ratings of the child's general ability e.g. "He look unsure, but he's a good student, so I think he got it right" or other personal information e.g. "I don't know her but her sister was a good student so I think she got it right". When questioned whether the teachers were looking for non-verbal cues or simply using past performance as the criteria, each reported consideration of the cues but noted that personal information about the

students was a factor in their final decision. The gifted child referred to earlier, who so often was misevaluated, was only evaluated correctly by his own teacher. Also, another child emerged as an atypical case. A female child was consistently rated by her teacher as being incorrect and unsure of herself when in fact this student had assessed her abilities well. Discussion with her teacher regarding this, after viewing both tapes, revealed that her teacher viewed her as an average student who would be more often wrong than right despite the fact that her grades were consistently at a C or better level. So, personal information used incorrectly can bias a teacher against a child as well as for them.

In conclusion, past performance is a good predictor of future student performance for teachers, particularly when other information is ambiguous or unavailable. The combination of nonverbal cues and knowledge of the child probably allows for more accurate prediction than does either alone. But it is hard to sort out when teachers are acting as Baysian statisticians, computing present odds based on past performance, and when they are accurately decoding student non-verbal cues.

Study 3

It occurred to us that children may be better able than adults to decode the non-verbal cues of other children, since they depend on such cues to guide their everyday interpersonal behavior. So a further study was conducted. Twenty-two 4th grade students in the Peoria School District were shown the two tapes in their regular classroom setting. Their teacher was present; however, she did not participate. Directions were similar to those used for teachers but did not include information on the relevance of the study to teaching. Students remained seated at their desks and wrote "right" or "wrong" on their answer sheet, a looseleaf sheet they had numbered to 15. Children viewed the first tape and some were

allowed to respond orally to each film clip. Of those children that raised their hand, some were called on to give their decision and provide an explanation for that decision. After several students responded to each clip, there was a show of hands about whether the student in the video was right or wrong, and students were given feedback. As the clips continued, students showed the same confusion exhibited by teachers. They observed similar non-verbal cues, but interpretation was often different. Also, the students who were subjects occasionally made remarks about the personal characteristics of the student being viewed. This apparently influenced their decision. Responses to tape 2 were covert with no discussion allowed.

The mean number correct for tape 2 was 5.82, well below the scores of most respondents in Experiment I, but closest to the performance of novices in the discussion group. Many of the same comments stated earlier apply here. Students were best when they followed their own instincts. They seemed to become confused, and their performance deteriorated, when competing interpretations were offered.

Study 4

Because there appeared to be a training effect in study one, attributable to the feedback about the correctness or incorrectness of the subjects responses, further investigation seemed called for. Two preservice classes of teachers, novice teachers who had not yet participated in student teaching, were recruited to participate in this study. By random assignment one class was assigned to the discussion treatment, the other to the discussion plus feedback treatment. Procedures similar to those used in Study One were followed. In this study, however, we sought information about how experience with children in social situations, and self ratings of social intelligence, might affect performance. A brief

questionnaire was administered to these pre-service teachers assessing experience (and self reports of competency in understanding), with children of the type presented on the video clips. A single score was derived from the questionnaire, indicating the degree of social sensitivity the subjects might have with students.

Table 4 presents the performance data obtained in this study. As can be seen, there were no gains from tape one to tape two in the discussion treatment. On the other hand, in the discussion plus feedback condition, gains were made from tape one to tape two. The mean gain of .92 points was statistically significant ($t = 2.29$, $P < .03$).

The correlations with the measure of social sensitivity were generally near zero, with one exception, ($r = .55$, between score on tape 1 and score on the measure of social sensitivity in the discussion plus feedback class). But no trends could be detected. There appeared to be no relation between this measure of social sensitivity and a person's accuracy in reading non-verbal cues of comprehension in fourth graders.

Overall Findings

For the teacher education community, the major finding derived from these four small inquiries is that accuracy in decoding student comprehension from non-verbal cues is trainable. Study one provided some evidence of that, study four confirmed that finding. This conclusion was also reached by Jecker, Maccoby and Breitrose (1965). Our data suggest, however, that it was not just feedback that changed performance. The feedback about a particular child probably provided more information about that child's typical behavior, which aided a viewer in assessing subsequent clips of the child. The feedback provided a trace of the kind of information that the experts sought and that the teachers who were

familiar with the students used in their assessments. Although experts appeared only marginally better than others in this skill, when they also have knowledge about the students classroom performance, they appear to do particularly well at this task. Any training program or further research in this area must focus on the role that contextual knowledge plays in assessing the meaning of a child's non-verbal behavior.

Table 1. Mean accuracy and confidence by treatment and tape

	Experts Accuracy/Confidence				Advanced Beginner Accuracy/Confidence				Novice Accuracy/Confidence			
	Tape 1	Tape 2	Tape 1	Tape 2	Tape 1	Tape 2	Tape 1	Tape 2	Tape 1	Tape 2	Tape 1	Tape 2
Discussion	7.5	8.0	2.0	2.1	8.0	2.9	7.8	2.0	8.8	6.5	2.1	3.2
Discussion plus feedback	7.8	9.5	3.1	3.0	7.6	9.4	2.2	2.4	8.2	9.2	2.6	2.5

Table 2. Cues used in judgments of comprehension from non-verbal behavior emitted by students (combined for tapes one and two)

	Frequency of Mention		
Cue	Experts	Advanced Beginner	Novice
Quick/No hesitations	21	33	45
Slow/Hesitant	10	16	21
Confident/Secure/ Relaxed/Satisfied/ Aggressive/Positive	48	52	44
Lack of confidence/ Insecure/Tense Puzzled/Unsure	37	35	35
Attends/Interested/Listens	17	5	13
Distracted/Bored/Apathetic	28	14	12
Deliberate/Reviews Work	19	16	19
Guesses/Second Thoughts	12	14	9
Eye Movements	32	37	27
Facial Expressions	20	15	14
Extraneous Movements	36	41	21

Table 3. Mean accuracy and confidence by teachers who knew the target students

	Tape One	Tape Two
Accuracy	10.06	11.00
Confidence	2.08	3.01

Table 4. Mean accuracy score for novice teachers in two treatments*

	Tape One	Tape Two
Discussion (n = 29)	8.45 (1.30)	8.07 (1.44)
Discussion plus feedback (n = 29)	8.67 (1.88)	9.59 (1.32)

* Figures in parenthesis are standard deviations

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